

# *Concepts for Affordable Weapon Systems Evolution*

**14 -17 September 1998**  
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# A New Approach is Needed to Support Weapon Systems

## ***Conceptual Approach ...***

- **Institute the Commercial Acquisition Reform**
- **Revise Our Systems Engineering Process to Include Open Systems Approaches**
- **Measure and Monitor Weapon System Support**
- **Evolve the Weapon System Product, Continuously**
  - ✓ *Move From the Traditional Service Life Cycle Model to a Cyclic, Constant Cost Model for Major Weapon Systems*

## ***The Goal ...***

- **Reduce Total Cost of Ownership**
  - ✓ *Maintain Production Cost (~\$20M) at Significantly Lower Production Rates (24 AC/mth to 4-8 AC/mth)*
- **Lower Support Cost, At Higher Levels of Performance**
  - ✓ *Measure the Process... (20% Added Savings)*
  - ✓ *Software Support (50% reduction since 1993, another 50% by 2000)*

# Commercial Acquisition:

## *Our Way of Doing Business*



### **Evidence ... *Commercial Practices***

- ***“24-Month” Production Aircraft***
- ***\$10M Savings on Current Contracts***
- ***\$10M Savings on Future Contracts***

- **AS 9000 Recognized - March 1998**
  - ✓ Basic 20 ISO 9001 Elements and an Additional 30 Requirements Unique to Aerospace Manufacturing
- **ISO 9001 Certified - 1996**
  - ✓ *1st Major Aircraft Manufacturer and Aerospace Company*
  - ✓ LMTAS Now Using ISO 9001 in lieu of Military Quality Standards
  - ✓ British Standards Institution (BSI) audits LMTAS continuously for ISO 9001
- **Commercial-Based Practices and Standards Are Applied for All Future Aircraft Programs and Projects**
- **Current Commercial Acquisitions:**  
Production F-16, KTX-2, F-2, JSF

***... An Important Part of Our Commitment to be a Reliable ,  
Affordable Supplier of Advanced Fighter Aircraft***

# Open Systems:

## *How We Are Doing Business*

- **Insulates Product from Parts Obsolescence**
  - ✓ Hardware Independence
  - ✓ Software Portable
- **Reduces Test and Integration Time Significantly (*Goal 1/3 Reduction*)**
  - ✓ *Encapsulate the Software Change*
  - ✓ *Virtual Development Environment*
  - ✓ *Modular, Open System Interface Stds*
- **Provides Capability Modularity**
  - ✓ *Adaptable to Any Product Line*
  - ✓ *Easily Add/Delete for FMS Sales*
  - ✓ *Product Isolation for Secure Projects*
- **Disciplines the SE Process**
  - ✓ *Building Codes (Technical Architecture)*
  - ✓ *Open System Standards and Practices*



### **Evidence ... *Commercial Standards***

- ***F-16 Block 60 Network (ATM)***
- ***Commercial Core (F-16, KTX-2)***
- ***Commercial Practices (ISO 9001)***
- ***Paperless Contracting (Joint Management Council - Pilot Site)***

***“Today’s Environment Demands That We Closely Scrutinize the Way We Operate and Make Changes...”***

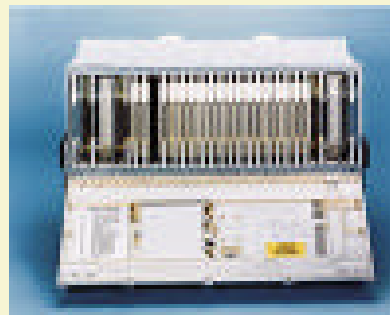
*Kathy Eppers, Director of Acquisition Reform Initiatives, LMTAS*

# Why Move to Commercial?

...To Lower the Cost of Military Avionics, the Military Must Shift from a Developer to a "Consumer" of Electronic Products...



***Line Replaceable***  
Three-Level  
Maintenance  
1980s



***Modular SEM E***  
Two-Level  
Maintenance  
1990s

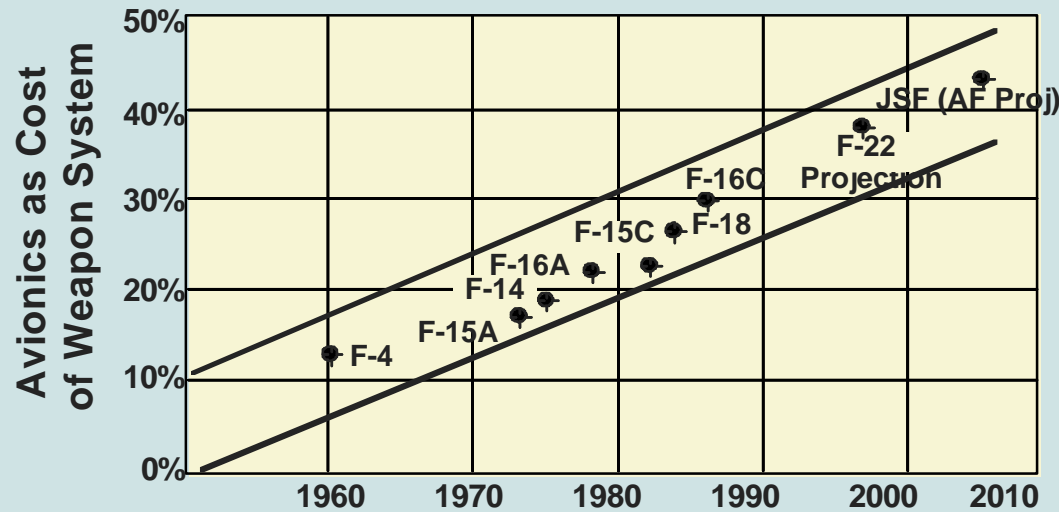


***Modular COTS***  
One-Level  
"Throw-Away"  
Maintenance  
2000s

- Military Driven by a Cost Paradigm
- Performance Parity – Equal or Better
- Military Support Strategy Must Evolve

**Military Electronics Market Is Too Small To Drive Commercial Products**

# Commercial Practices are Needed for Military Systems to Reduce Costs

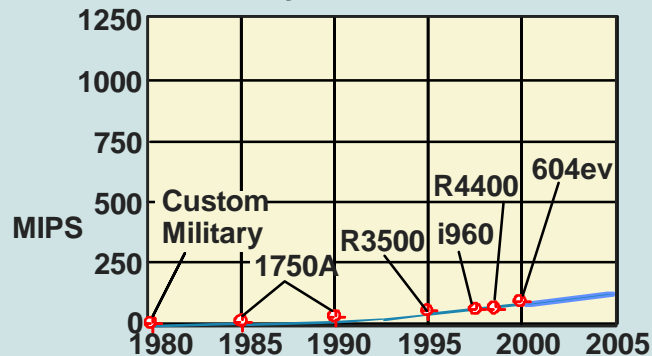


\*Estimate Based on Total Production Plus Operational & Support

...Insert Up-To-Date Technology...

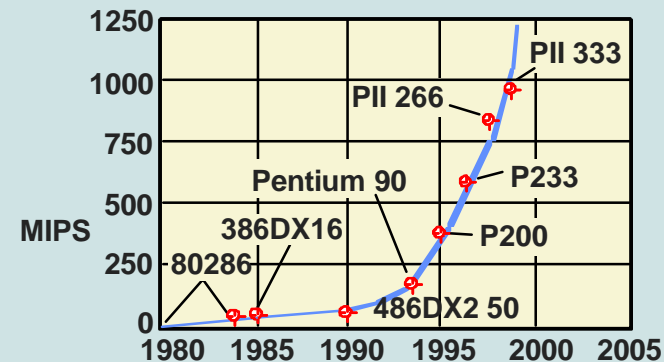
- Modular Avionics
- Integrated Sensors
- Open Systems
- "Throw-Away" Avionics
- Commercial Technologies

## Military Aircraft CPUs



- 10-15 Years from CPU Choice to Aircraft IOC
- Software Not Compatible Between CPUs
- Design New Software Tools Per CPU
- CPU Ruggedized for Military

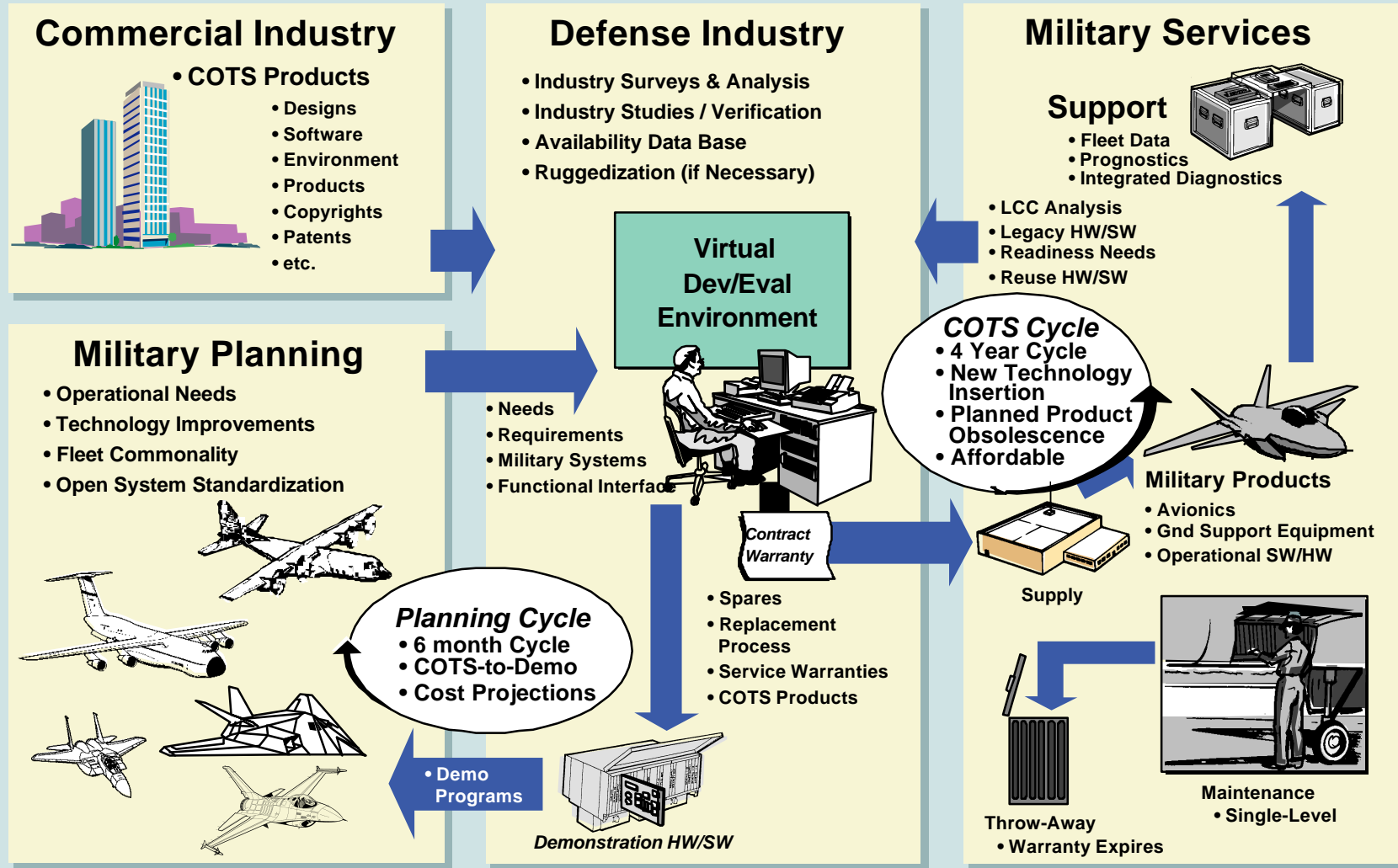
## Commercial Intel CPUs



- 6 Month Interval Between New Products
- Existing Software Usable on New CPUs
- Software Tools Readily Available
- ISO9001 Qualification Requirement



# Planning Is Essential



# Measure & Monitor the Weapon System

## ***What to Do ...***

- **Prognostics**

*prediction of component degradation or impending failure*

- **Autonomic Logistics**

*collect electronic information to determine, plan and perform needed maintenance with minimal downtime*

## ***The Payoff ...***

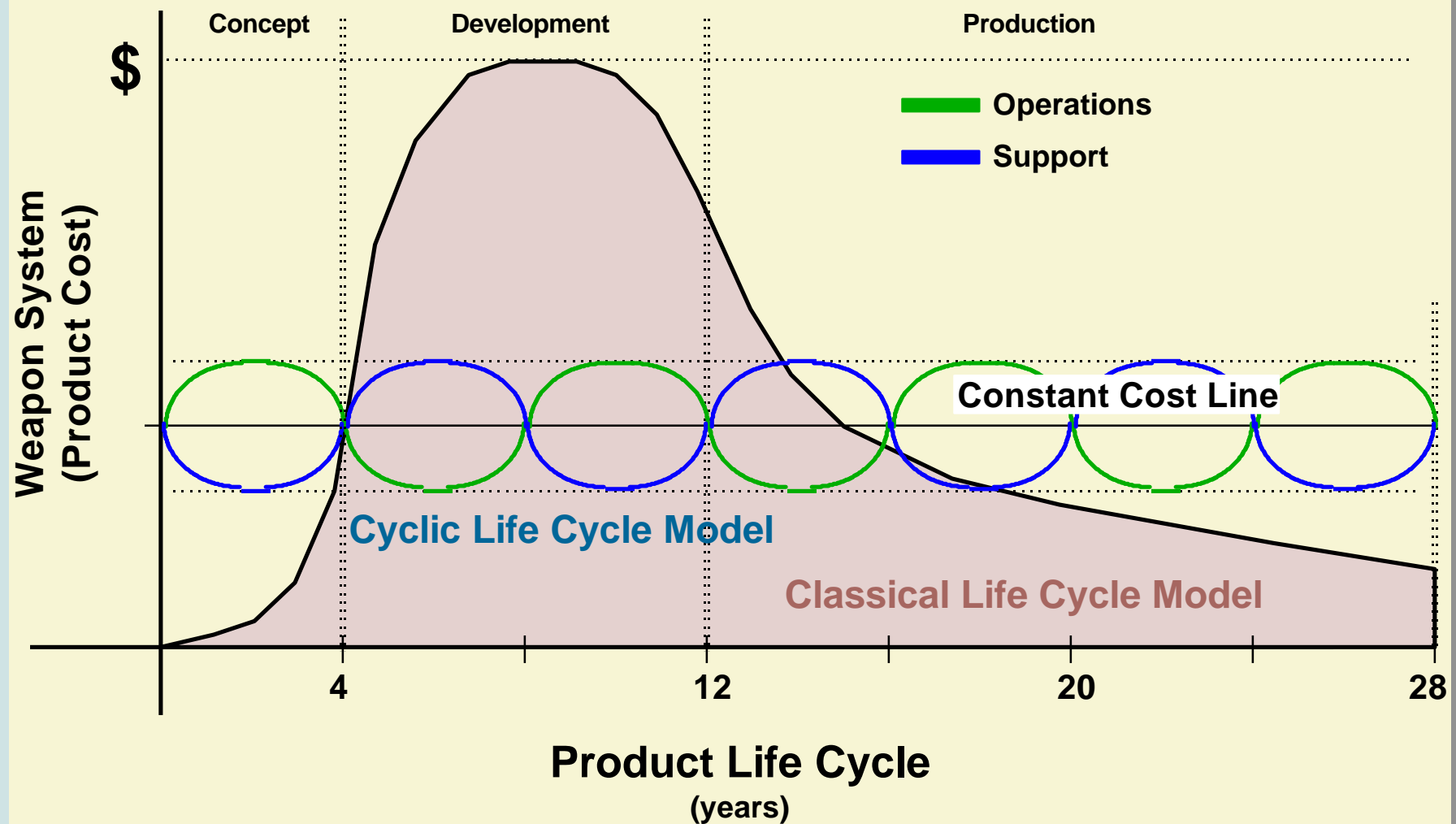
- **Significantly Lower Operations and Support Costs (20%)**
- **Enabler for Condition Based Maintenance**
- **Reduce the Costly Process of Inspections at Regularly Scheduled Intervals Which is Labor Intensive**

## ***Evidence ...***

- **Risk Reduction Program: Navy's Air Vehicle Prognostics and Health Management (AVPHM) Program**



# Modeling for Lean Product Evolution



# Evolve the Product ...

## ... Lower-Cost, Open System Architectures

